THURSDAY, FEBRUARY 13, 1872

THE "THUNDERER" EXPLOSION

NOW that the Committee appointed to inquire into the cause of the bursting of one of the 38-ton guns on board the *Thunderer* have made known the substance of their report, it is no longer necessary to suspend judgment and withhold comment for fear of prejudicing the case. The abstract only of the report of the Committee, which has reached us by telegram, states that the explosion was due to a cause, which, as far as we are aware, was not anticipated by any one of the numerous writers who have made suggestions or advanced theories on the subject. They simply report that the gun having missed fire when loaded with the battering charge, was again loaded with a full charge, and fired with both of the charges in the gun at the same time. We are bound to assume that conclusive evidence of this extraordinary occurrence has been obtained by the Committee, or the statement would be simply incredible. Cases are recorded in volley-firing of a soldier loading charge after charge into his musket or rifle in the days of muzzle-loaders, being unaware that the first had missed fire until the violent explosion, and perhaps bursting of his piece, or the apparent growth of his ramrod showed that something unusual was taking place, but that a squad of blue-jackets serving a 38-ton gun should be unaware, or even uncertain, if the 110 lb. of powder they were supposed to be firing had exploded or not is beyond comprehension. Even if the two guns in the fore turret were being fired simultaneously by electricity, the absence of recoil would have alone been sufficient to indicate that the gun had missed fire. That the rammer did not pass home might, it is conceivable, have escaped notice in loading the second round with the hydraulic gear, but we must look to the report of the Committee for some explanation of the first miss-fire having escaped notice.

In the many suggestions that have been made respecting the probable cause of the disaster by the writers of letters to the daily and weekly papers, it appears to us that a too low estimate has generally been made of the strength of the gun. It has been assumed by many that if it could be shown that the projectile slipped forward in the bore on the withdrawal of the rammer, a sufficient cause for the accident had been discovered. Experiments were at once tried at Woolwich which established the fact that when no ring-wad was used the shot frequently followed the rammer on its withdrawal for a distance of three or four feet. Instances have also been given of the bursting of fowling-pieces through an accidental stoppage of the muzzle by snow or a wad, and it was thought by many that a clear case had been made out for the cause of the explosion. Sir William Palliser's experiments, however, disprove the truth of this suggestion, for, many years ago, in firing an experimental 8-inch gun with various air spaces up to four feet between the powder charge and the shot, he found that there was no dangerous pressure in the bore. The gun made use of in this experiment was an old cast-iron 68-pounder which was converted into an 8-inch rifled gun, on Sir William Palliser's system by the insertion of a coiled wrought-iron tube 2½ inches thick. This gun was fired with 22 lbs. of powder and a shot of 180 lbs. weight, with successive air spaces of 10 inches, 20 inches, up to 50 inches between the powder and the shot, and sustained no damage. Sufficient experiments have not yet been made to indicate accurately all the variations of pressure that would be introduced by an air-space between the powder charge and shot, but the only cause which would tend to raise the gas pressure, and in particular the longitudinal and twisting strain on the gun, above that due to an ordinary discharge is the fact that the pitch of the rifling would be sharper where the projectile started in the former case than in the latter. In the case of a fowling-piece the cause of bursting with a slight stoppage at the muzzle is probably due rather to the weakness of the barrel at that part than to the excessive pressure. In the 38-ton gun, with the heaviest charges employed on service, the central part of the length of the gun known as the 1 B coil is probably amply strong enough to resist the pressure brought to bear upon it, even if the shot was in this part of the bore and the maximum gas-pressure exerted. Although it has been shown by the report of the Committee that none of the conjectures as to the cause of the accident is correct, there is still utility in examining them, for, if valid, they might bring about a similar accident at some future time, and should therefore be provided against. Though the running forward of the shot when the gun is much depressed for loading with the hydraulic gear would cause but a small risk of explosion to the gun, it is so undesirable for many other reasons, that means should be taken to render it impossible, or at least render its detection a certainty. The means at present employed to obviate the shifting of the shot when once rammed home, consist of a ring wad which fits round the pointed head of the shot, and is firmly wedged in between it and the bore. Here again we are provided with a very possible chance of an accident. The two letters of Sir William Palliser published in the *Times* pointed out what appeared to us, before the publication of the report, by far the most probable solution of the problem: it consisted simply in the employment at the same time of a gas-check and a ring-wad. As clearly pointed out by Sir William, it is merely a question of the relative coefficient of friction between the shot and the wad and between the wad and the surface of the bore, which has to decide whether the wad is forced along the bore when the shot commences to move, or whether the head of the shot is forced further into the wad, wedging it tightly against the surface of the bore. This action would be impossible without the employment at the same time of a gas-check, as the gas rushing past the shot would inevitably dislodge the wad. The gas-check consists of a cupped disk of copper with the periphery turned down so as to form a flange; this is fitted to the base of the projectile, and, when fired, the pressure of the gas causes the flange to expand and press firmly on the surface of the bore, both in the grooves and in the lands between them, thus preventing the passage of the gas past the shot. Sir William says: "With regard to the friction between the wad and the gun, it is a fact that when the atmosphere is moist the residue of the powder deposits itself upon the surface of the bore in a black, greasy substance which reduces friction to a very low point. On a dry day, however, this deposit assumes the

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form of a hard, dry, and rough coating like emery paper, and the friction in the bore is increased to a very large extent." Thus it may readily be seen that under varying circumstances the requisite conditions are very likely to occur, and experiments should most undoubtedly be undertaken to test the validity of this source of accident, and we think that great credit is due to Sir William Palliser for having been the first to point it out. Yet another cause has been insisted on as likely to bring about the destruction of some of our Woolwich rifled guns. In a paper read by Prof. Osborne Reynolds at the meeting of the British Association at Bradford, it was shown that the system of rifling employed at Woolwich, giving a gradually increasing twist to the grooves, threw a much greater strain on the gun than a uniform twist, and rendered it impossible for the studs on the shot to fit the grooves with accuracy throughout the whole length of the bore. The objections raised by Prof. Reynolds have, we believe, remained unanswered and perhaps unnoticed now for five or six years by the departmental officers, and during this time many hundreds of guns have been constructed on the condemned principle. Now that so much public attention is being directed to the whole system of gun manufacture as carried on at Woolwich, and the criticisms adverse to its merits are so numerous it would be well that the country should have further assurance that the system is founded on a safe scientific basis, or that the errors, if they exist, should be admitted and rectified.

It is admitted that with the increasing twist in the rifling the shearing of the studs has frequently shown that the projectile has some difficulty in centring itself in the bore while the great wear in the steel tubes of the guns occasionally used for practice on board ship points to a short life for the gun, but we are not aware that the destruction of a gun has hitherto been traced with certainty to the jamming of the studs between two grooves. In the event of this occurring it is shown conclusively by Mr. Longridge, in a letter inserted in *Engineering* last week, that the strain would be far more than sufficient to burst the gun. The bursting pressure of the gases would easily split the tube and coils, or the energy of the shot if only moving with a moderate velocity would cause a longitudinal stress which the steel tube would be quite unable to resist.

It may appear to some useless to draw particular attention to the various causes of this terrible accident that have been suggested now that the report of the Committee has been made known and has shown that all the suppositions are equally erroneous, but in our opinion it is of the utmost importance that these dangers to which we direct attention and which might at any time cause a similar accident, should not be passed over and forgotten.

CAPTAIN COOK

IT seems on first thoughts rather a strange proceeding to publicly celebrate the centenary of the death of a great man, especially when that death was a murder. But this is what the Paris Geographical Society have arranged to do to-morrow in the case, not of any of their own explorers or navigators, but in the case of England's greatest exploring navigator, Captain James Cook, who was murdered 100 years ago to-morrow by the natives of the Sandwich Islands. But we know that the generous-minded Frenchmen do not intend to rejoice at the death of this great man, as they would do were it his birth they intended to commemorate. Cook, they know, was one of the greatest of geographical explorers, and it is quite natural and commendable that the Society, in their enthusiasm for their science and its promoters, should wish in some way to show their reverence for a man like Cook on the centenary of his remarkable death. Cook, and with him England, owed some gratitude to the French, whose government of the time, though at war with this country, generously gave instructions to their war-ships and colonial governors, not only not to molest Cook in his pursuit of knowledge, but to render him all reasonable assistance. It is obvious that only about every third generation can take part in celebrating the centenary of a man's birth, and it is natural, therefore, that those of the intermediate generation who count him among their heroes, should take advantage of the occurrence of the centenary of his death to show their appreciation of his greatness. In Cook's case birthday and death-day were only about half a century apart, the date of the former being October 27, 1728.

Why our own Geographical Society should have left it to our French neighbours to commemorate so remarkable an event in the history of geographical discovery, we cannot undertake to say, though it seems to savour somewhat of dog-in-the-manger that they have declined the invitation to send an official representative. It would surely have been easy for them to have organised some kind of demonstration that would both have honoured the memory of one of our greatest naval heroes and most scientific of navigators, and at the same time have proved both interesting and instructive to the public. However, England will not be entirely unrepresented to-morrow, as we understand the Admiralty are contributing several original charts to the exhibition of the Paris Society. Mr. Brassey, who has visited the spot where Cook was killed, has sent to the Society a number of views and documents to be exhibited. Mr. Jackson has also promised to send valuable maps and manuscripts from Cook's own hand. Researches will be executed in the Archives to discover the original of the *Ordre du Roi*, forbidding French cruisers to molest Captain Cook's expedition, and in spite of the declaration of war, to assist him if necessary for the fulfilling of a mission interesting the whole of mankind.

We need not recount the claims of Captain Cook to be regarded as one of the greatest, as he was one of the most scientific, of navigating explorers; probably there are few of our readers who have not at one time or other read some account of the voyages of Captain Cook. The son of a peasant, he rose to his honourable position by sheer force of genius and its invariable accompaniment, hard work. To him we owe the discovery of the Sandwich, and many other Pacific Islands. His enthusiasm on behalf of science was manifested in his work at Tahiti in connection with the memorable transit of Venus of June 3, 1769. He gave certainty to our knowledge of New Zealand, and left not much to be done to fill up with accuracy an outline of the coast of Australia. He proved

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